REVISIONS

LTR	DESCRIPTION	DATE (YR-MO-DA)	APPROVED
A	Table I; For tests V_{OUT}, V_{RIP}, VR_{LINE}, VR_{LOAD}, I_{RIP}, Eff, F_S, F_{SYNC}, VT_{LOAD}, TT_{LOAD}, V_{TLINE}, TT_{LINE}, $Vton_{OS}$, Ton_D, and Tr_{LF} change I_{OUT} from 12 A to 12.12 A. Table I Output current test, change max limit from 12 A to 12.12 A. Table I V_{OUT} ripple voltage test, change max limit for subgroup 01 (non RHA) from 50 mV p-p to 35 mV p-p and for subgroups 02 and 03 (non RHA) from 75 mV p-p to 50 mV p-p. Table I delete short circuit current test. For I_{in} ripple current change max limit for subgroups 02 and 03 (non RHA) from 60 mA p-p to 50 mA p-p. Table I, V_{OUT} step load transient test, change min/max limits from -400/+400 to -300/+300 for device type 02 (non RHA), also for device type 02 (RHA) change min/max limit from -1000/+1000 to -300/+300. Paragraph 4.3.5, add RHA levels "P" and "L" to table. Update bulletin page to include RHA levels "P" and "L" part numbers. -gc	07-07-09	Robert M. Heber
B	Table I, External sync range test, conditions column, change "TTL level" to "Active high level". Table I, update footnote 5/. Figure 2, correct table for device type 01. Table II, add note to Group C end-point test parameters. 4.3.5, change the units for Single event upset survival level. SMD bulletin page, correct device type 01. -gz	10-03-10	Charles F. Saffle
C	Figure 1, Case outline X; Changed dimension from "E1" to "E" and the dimension from "E2" to "E1". Updated drawing paragraphs. -sld	12-06-01	Charles F. Saffle

REV																				
SHEET																				
REV	C	C																		
SHEET	15	16																		

REV STATUS	REV	C	C	C	C	C	C	C	C	C	C	C	C	C	C
OF SHEETS	SHEET	1	2	3	4	5	6	7	8	9	10	11	12	13	14

PMIC N/A

PREPARED BY
Greg Cecil

DLA LAND AND MARITIME
COLUMBUS, OHIO 43218-3990
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STANDARD MICROCIRCUIT DRAWING

THIS DRAWING IS AVAILABLE FOR USE BY ALL DEPARTMENTS AND AGENCIES OF THE DEPARTMENT OF DEFENSE

AMSC N/A

CHECKED BY
Greg Cecil

APPROVED BY
Joe Rodenbeck

DRAWING APPROVAL DATE
07-02-06

MICROCIRCUIT, HYBRID, LINEAR, 3.3 VOLT, SINGLE CHANNEL, DC-DC CONVERTER

REVISION LEVEL
C

SIZE	CAGE CODE	
A	**67268**	**5962-06213**

SHEET 1 OF 16

DSCC FORM 2233
APR 97

5962-E355-12

1. SCOPE

1.1 Scope. This drawing documents five product assurance classes as defined in paragraph 1.2.3 and MIL-PRF-38534. A choice of case outlines and lead finishes which are available and are reflected in the Part or Identifying Number (PIN). When available, a choice of radiation hardness assurance levels are reflected in the PIN.

1.2 PIN. The PIN shall be as shown in the following example:

5962	-	06213	01	H	X	A
½	½		½	½	½	½
½	½		½	½	½	½
½	½		½	½	½	½
Federal stock class designator	RHA designator (see 1.2.1)		Device type (see 1.2.2)	Device class designator (see 1.2.3)	Case outline (see 1.2.4)	Lead finish (see 1.2.5)
_____	_____/					
\/						
Drawing number						

1.2.1 Radiation hardness assurance (RHA) designator. RHA marked devices shall meet the MIL-PRF-38534 specified RHA levels and shall be marked with the appropriate RHA designator. A dash (-) indicates a non-RHA device.

1.2.2 Device type(s). The device type(s) identify the circuit function as follows:

Device type	Generic number	Circuit function
01	MFL283R3S	DC-DC converter, 50 W, +3.3 V output
02	SMFL283R3S	DC-DC converter, 50 W, +3.3 V output

1.2.3 Device class designator. This device class designator shall be a single letter identifying the product assurance level. All levels are defined by the requirements of MIL-PRF-38534 and require QML Certification as well as qualification (Class H, K, and E) or QML Listing (Class G and D). The product assurance levels are as follows:

Device class	Device performance documentation
K	Highest reliability class available. This level is intended for use in space applications.
H	Standard military quality class level. This level is intended for use in applications where non-space high reliability devices are required.
G	Reduced testing version of the standard military quality class. This level uses the Class H screening and In-Process Inspections with a possible limited temperature range, manufacturer specified incoming flow, and the manufacturer guarantees (but may not test) periodic and conformance inspections (Group A, B, C, and D).
E	Designates devices which are based upon one of the other classes (K, H, or G) with exception(s) taken to the requirements of that class. These exception(s) must be specified in the device acquisition document; therefore the acquisition document should be reviewed to ensure that the exception(s) taken will not adversely affect system performance.
D	Manufacturer specified quality class. Quality level is defined by the manufacturers internal, QML certified flow. This product may have a limited temperature range.

1.2.4 Case outlines. The case outlines are as designated in MIL-STD-1835 and as follows:

Outline letter	Descriptive designator	Terminals	Package style
T	See figure 1	12	Tabbed flange mount, lead formed up
U	See figure 1	12	Flange mount, lead formed down
X	See figure 1	12	Flange mount, short lead
Y	See figure 1	12	Tabbed flange mount, short lead
Z	See figure 1	12	Tabbed flange mount, lead formed down

1.2.5 Lead finish. The lead finish shall be as specified in MIL-PRF-38534.

1.3 Absolute maximum ratings. 1/

Input voltage range (V_{IN}) 2/	-0.5 V dc to +50 V dc
Power dissipation (P_D):	
Device type 01 and 02 (non-RHA)	16 W
Device type 02 (RHA level P,L,R)	18 W
Lead soldering temperature (10 seconds)	+300°C
Storage temperature range	-65°C to +150°C

1.4 Recommended operating conditions.

Input voltage range (V_{IN})	+16 V dc to +40 V dc
Output power	£ 40 W
Case operating temperature range (T_C)	-55°C to +125°C

1.5 Radiation features.

Maximum total dose available (dose rate = 9 rad(Si)/s):	
Device type 02 (RHA level P,L,R)	100 krad (Si) 3/

2. APPLICABLE DOCUMENTS

2.1 Government specification, standards, and handbooks. The following specification, standards, and handbooks form a part of this drawing to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-38534 - Hybrid Microcircuits, General Specification for.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-883 - Test Method Standard Microcircuits.
MIL-STD-1835 - Interface Standard for Electronic Component Case Outlines.

1/ Stresses above the absolute maximum ratings may cause permanent damage to the device. Extended operation at the maximum levels may degrade performance and affect reliability.
2/ An undervoltage lockout circuit shuts the unit off when the input voltage drops to approximately 12 volts. Operation of the unit between 12 volts and 16 volts is nondestructive at reduced output power, but performance is not guaranteed.
3/ These parts may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end-point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition C, tested at 9 rad(Si)/s.

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-103 - List of Standard Microcircuit Drawings.
MIL-HDBK-780 - Standard Microcircuit Drawings.

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2 Order of precedence. In the event of a conflict between the text of this drawing and the references cited herein, the text of this drawing takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Item requirements. The individual item performance requirements for device classes D, E, G, H, and K shall be in accordance with MIL-PRF-38534. Compliance with MIL-PRF-38534 may include the performance of all tests herein or as designated in the device manufacturer's Quality Management (QM) plan or as designated for the applicable device class. The manufacturer may eliminate, modify or optimize the tests and inspections herein, however the performance requirements as defined in MIL-PRF-38534 shall be met for the applicable device class. In addition, the modification in the QM plan shall not affect the form, fit, or function of the device for the applicable device class.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-PRF-38534 and herein.

3.2.1 Case outlines. The case outlines shall be in accordance with 1.2.4 herein and figure 1.

3.2.2 Terminal connections. The terminal connections shall be as specified on figure 2.

3.2.3 Radiation exposure circuit. The radiation exposure circuit shall be maintained by the manufacturer under document revision level control and shall be made available to the preparing and acquiring activity upon request.

3.3 Electrical performance characteristics. Unless otherwise specified herein, the electrical performance characteristics are as specified in table I and shall apply over the full specified operating temperature range.

3.4 Electrical test requirements. The electrical test requirements shall be the subgroups specified in table II. The electrical tests for each subgroup are defined in table I.

3.5 Marking of devices. Marking of devices shall be in accordance with MIL-PRF-38534. The device shall be marked with the PIN listed in 1.2 herein. In addition, the manufacturer's vendor similar PIN may also be marked.

3.6 Data. In addition to the general performance requirements of MIL-PRF-38534, the manufacturer of the device described herein shall maintain the electrical test data (variables format) from the initial quality conformance inspection group A lot sample, for each device type listed herein. Also, the data should include a summary of all parameters manually tested, and for those which, if any, are guaranteed. This data shall be maintained under document revision level control by the manufacturer and be made available to the preparing activity (DLA Land and Maritime -VA) upon request.

3.7 Certificate of compliance. A certificate of compliance shall be required from a manufacturer in order to supply to this drawing. The certificate of compliance (original copy) submitted to DLA Land and Maritime -VA shall affirm that the manufacturer's product meets the performance requirements of MIL-PRF-38534 and herein.

3.8 Certificate of conformance. A certificate of conformance as required in MIL-PRF-38534 shall be provided with each lot of microcircuits delivered to this drawing.

4. VERIFICATION

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-PRF-38534 or as modified in the device manufacturer's Quality Management (QM) plan. The modification in the QM plan shall not affect the form, fit, or function as described herein.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions 1/ 2/ -55°C £ T_C £ +125°C V_{IN} = 28 V dc ±0.5 V dc no external sync unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
Output voltage	V_{OUT}	I_{OUT} = 12.12 A dc	1	01,02	3.26	3.34	V
			2,3		3.21	3.39	
		P,L,R	1,2,3	02	3.10	3.51	
Output current	I_{OUT}	V_{IN} = 16 V dc to 40 V dc	1,2,3	01,02	0.0	12.12	A
		P,L,R	1,2,3	02	0.0	12.12	
V_{OUT} ripple voltage	V_{RIP}	I_{OUT} = 12.12 A, BW = 10 kHz to 2 MHz	1	01,02		35	mV p-p
			2,3			50	
		P,L,R	1,2,3	02		100	
V_{OUT} line regulation	VR_{LINE}	I_{OUT} = 12.12 A, V_{IN} = 16 V dc to 40 V dc	1,2,3	01,02		20	mV
		P,L,R	1,2,3	02		30	
V_{OUT} load regulation	VR_{LOAD}	I_{OUT} = 0 to 12.12 A	1,2,3	01,02		40	mV
		P,L,R	1,2,3	02		40	
Input current	I_{IN}	I_{OUT} = 0 A, Inhibit (pins 4 and 12) = open	1,2,3	01,02		100	mA
		P,L,R	1,2,3	02		150	
		I_{OUT} = 0 A, Inhibit 1 (pin 4) tied to input return (pin 2)	1,2,3	01,02		14	
		P,L,R	1,2,3	02		17	
		I_{OUT} = 0 A, Inhibit 2 (pin 12) tied to output return (pin 8)	1,2,3	01,02		70	
		P,L,R	1,2,3	02		90	
I_{IN} ripple current	I_{RIP}	I_{OUT} = 12.12 A, BW = 10 kHz to 10 MHz	1,2,3	01,02		50	mA p-p
		P,L,R	1,2,3	02		75	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ 2/ $-55°C \le T_C \le +125°C$ V_{IN} = 28 V dc ±0.5 V dc no external sync unless otherwise specified		Group A subgroups	Device type	Limits		Unit
						Min	Max	
Efficiency	Eff	I_{OUT} = 12.12 A		1	01	73		%
					02	71		
				2,3	01	71		
					02	69		
			P,L,R	1,2,3	02	68		
Isolation	ISO	Input to output or any pin to case at 500 V dc, T_C = +25°C		1	01,02	100		MW
			P,L,R	1	02	100		
Capacitive load 3/ 4/	C_L	No effect on dc performance T_C = +25°C		4	01,02		1000	mF
			P,L,R	4	02		1000	
Power dissipation load fault	P_D	Short circuit		1	01,02		14	W
				2,3			16	
			P,L,R	1,2,3	02		18	
Switching frequency	F_S	I_{OUT} = 12.12 A		4	01,02	550	650	kHz
				5,6		525	675	
			P,L,R	4,5,6	02	500	700	
External sync range 5/	F_{SYNC}	I_{OUT} = 12.12 A, Active high level to pin 6		4,5,6	01,02	525	675	kHz
			P,L,R		02	525	675	
V_{OUT} step load transient 6/	VT_{LOAD}	I_{OUT} = 6 A to 12.12 A		4,5,6	01, 02	-300	+300	mV pk
		I_{OUT} = 12.12 A to 6 A			01, 02	-300	+300	
		I_{OUT} = 6 A to 12.12 A	P,L,R	4,5,6	02	-300	+300	
		I_{OUT} = 12.12 A to 6 A						
V_{OUT} step load transient recovery 4/ 6/ 7/	TT_{LOAD}	I_{OUT} = 6 A to 12.12 A		4,5,6	01,02		3.0	ms
			P,L,R		02		4.0	
		I_{OUT} = 12.12 A to 6 A			01,02		3.0	
			P,L,R		02		4.0	

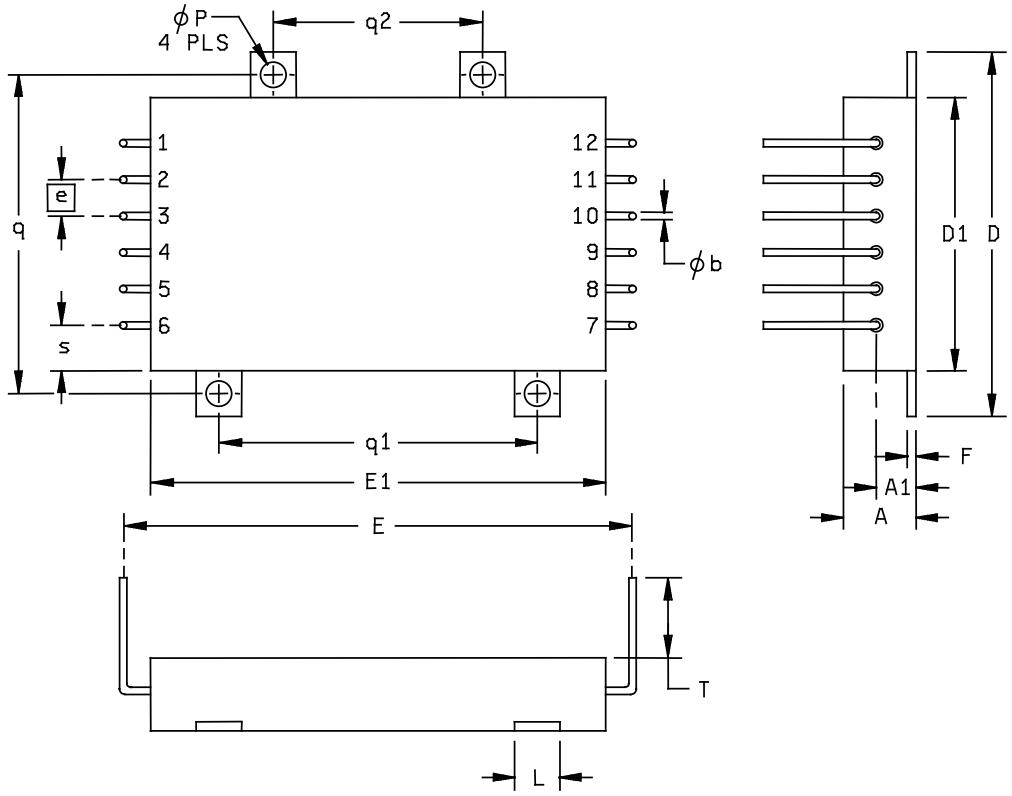
See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions 1/ 2/ $-55°C \le T_C \le +125°C$ V_{IN} = 28 V dc ±0.5 V dc no external sync unless otherwise specified	Group A subgroups	Device type	Limits		Unit
					Min	Max	
V_{OUT} step line transient 4/ 8/	V_{TLINE}	I_{OUT} = 12.12 A, Input step 16 V dc to 40 V dc	4,5,6	01,02		300	mV pk
		P,L,R		02		400	
		I_{OUT} = 12.12 A, Input step 40 V dc to 16 V dc		01,02		300	
		P,L,R		02		400	
V_{OUT} step line transient recovery 4/ 7/ 8/	TT_{LINE}	I_{OUT} = 12.12 A, Input step 16 V dc to 40 V dc	4,5,6	01,02		300	µs
		P,L,R		02		400	
		I_{OUT} = 12.12 A, Input step 40 V dc to 16 V dc		01,02		300	
		P,L,R		02		400	
Start up overshoot 4/	$Vton_{OS}$	I_{OUT} = 12.12 A, V_{IN} = 0 to 40 V dc	4,5,6	01,02		25	mV pk
		P,L,R		02		50	
Start up delay 9/	Ton_D	I_{OUT} = 12.12 A, V_{IN} = 0 to 28 V dc	4,5,6	01,02		10	ms
		P,L,R		02		16	
Load fault recovery 4/	Tr_{LF}	I_{OUT} = 12.12 A	4,5,6	01,02		6	ms
		P,L,R		02		12	

1/ Post irradiation testing shall be in accordance with 4.3.5 herein.
2/ These parts may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects. Radiation end-point limits for the noted parameters are guaranteed only for the conditions as specified in MIL-STD-883, method 1019, condition C, tested at 9 rads(Si)/s.
3/ Capacitive load may be any value from 0 to the maximum limit without compromising dc performance.
4/ Parameter shall be tested as part of design characterization and after design or process changes; therefore, the parameter shall be guaranteed to limits specified in table I.
5/ A waveform (V_{IH} = 4.5 V to 9 V, V_{IL} = 0.8 V maximum) with 50 percent ±10 percent duty cycle applied to the sync input pin (pin 6) within the sync range frequency shall cause the converter's switching frequency to become synchronous with the frequency applied to the sync input pin (pin 6).
6/ Load step transition time is between 2 and 10 microseconds.
7/ Recovery time is measured from the initiation of the transient until V_{OUT} has returned to within ±1 percent of its final value.
8/ Input step transition time greater than 10 microseconds.
9/ Turn-on delay time measurement is either for a step application of power at the input or the removal of a ground signal from the inhibit 1 pin (pin 4) or inhibit 2 pin (pin 12) while power is applied to the input.

Case outline T.

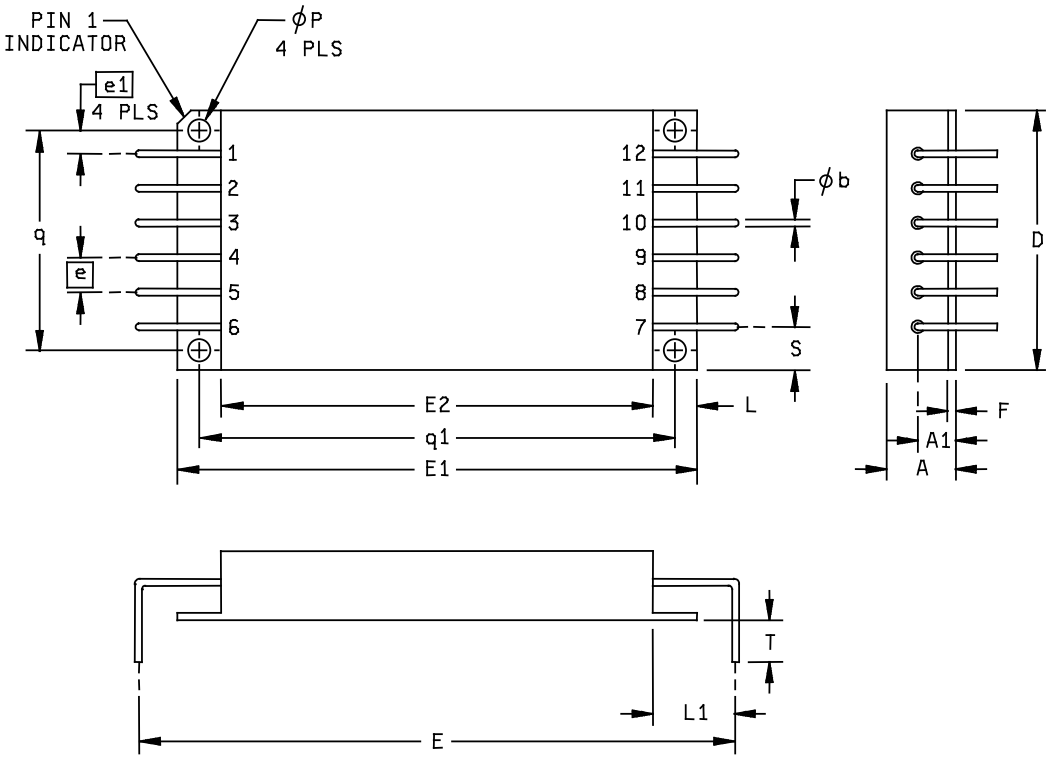


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		10.16		.400
A1	5.33	5.84	.210	.230
f b	0.89	1.14	.035	.045
D	50.55	51.05	1.990	2.010
D1	37.85	38.35	1.490	1.510
e	5.08 BSC		.200 BSC	
E	69.85	72.39	2.750	2.850
E1	63.25	63.75	2.490	2.510
F	1.14	1.40	.045	.055
L	6.10	6.60	.240	.260
f P	3.43	3.68	.135	.145
q/q1	44.20	44.70	1.740	1.760
q2	28.96	29.46	1.140	1.160
s	6.10	6.60	.240	.260
T	10.92	11.43	.430	.450

NOTES:
1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Device weight: 100 grams maximum.

FIGURE 1. Case outlines.

Case outline U.

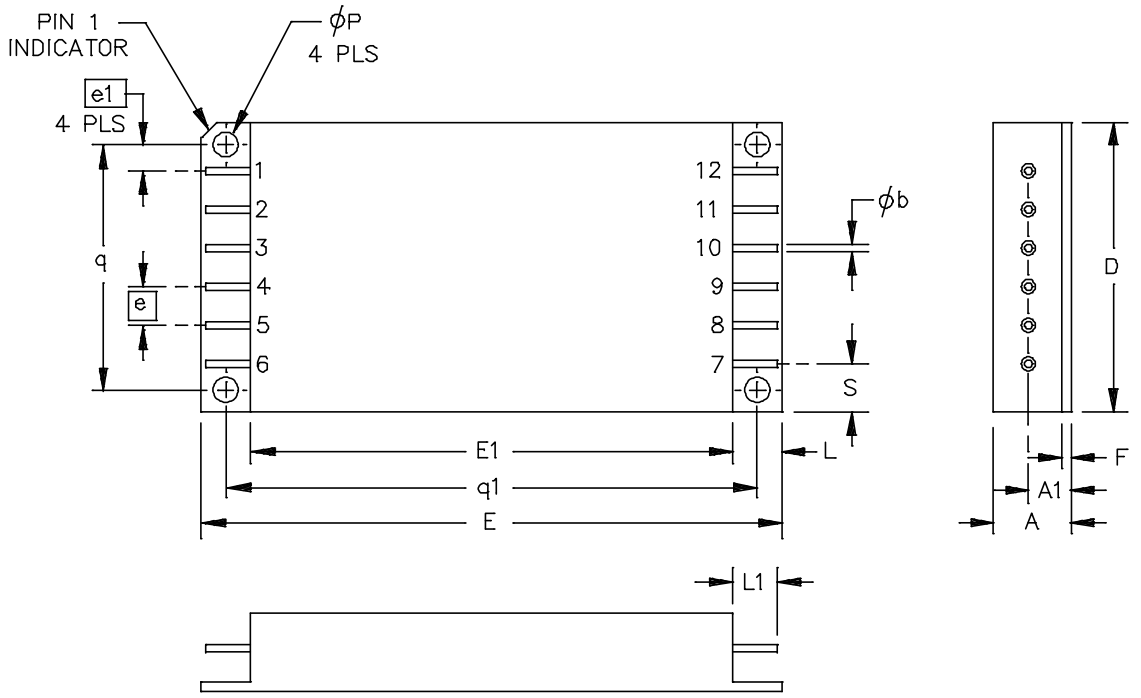


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		10.16		.400
A1	5.46	5.72	.215	.225
f b	0.89	1.14	.035	.045
D	37.97	38.23	1.495	1.505
e	5.08 BSC		.200 BSC	
e1	3.30 BSC		.130 BSC	
E	87.38	87.88	3.440	3.460
E1	75.95	76.45	2.990	3.010
E2	63.37	63.63	2.495	2.505
F	1.14	1.40	.045	.055
L	6.10	6.60	.240	.260
L1	11.94	12.19	.470	.480
f P	3.12	3.38	.123	.133
q	31.88	32.13	1.255	1.265
q1	69.85	70.36	2.750	2.770
S	6.22	6.48	.245	.255
T	5.84	6.86	.230	.270

NOTES:
1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Device weight: 100 grams maximum.

FIGURE 1. Case outlines - Continued.

Case outline X.

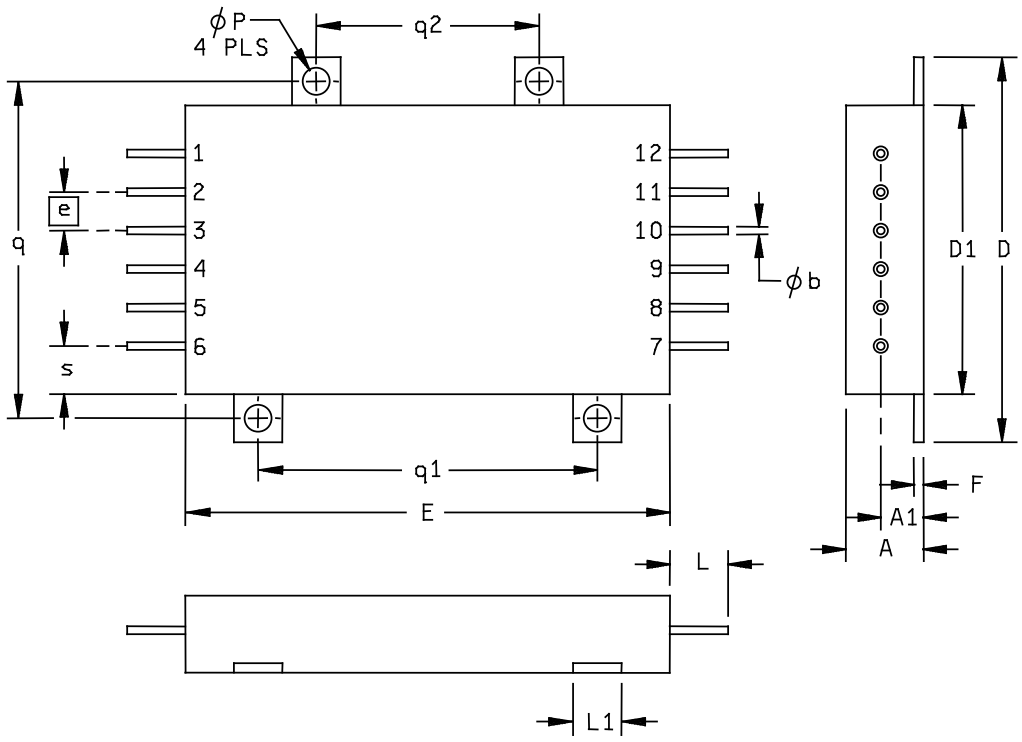


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		10.16		.400
A1	5.46	5.72	.215	.225
f b	0.89	1.14	.035	.045
D	37.97	38.23	1.495	1.505
e	5.08 BSC		.200 BSC	
e1	3.30 BSC		.130 BSC	
E	75.95	76.45	2.990	3.010
E1	63.37	63.63	2.495	2.505
F	1.14	1.40	.045	.055
L	6.10	6.60	.240	.260
L1	5.58	6.10	.220	.240
f P	3.12	3.38	.123	.133
q	31.88	32.13	1.255	1.265
q1	69.85	70.36	2.750	2.770
S	6.22	6.48	.245	.255

NOTES:
1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Device weight: 100 grams maximum.

FIGURE 1. Case outlines - Continued.

Case outline Y.

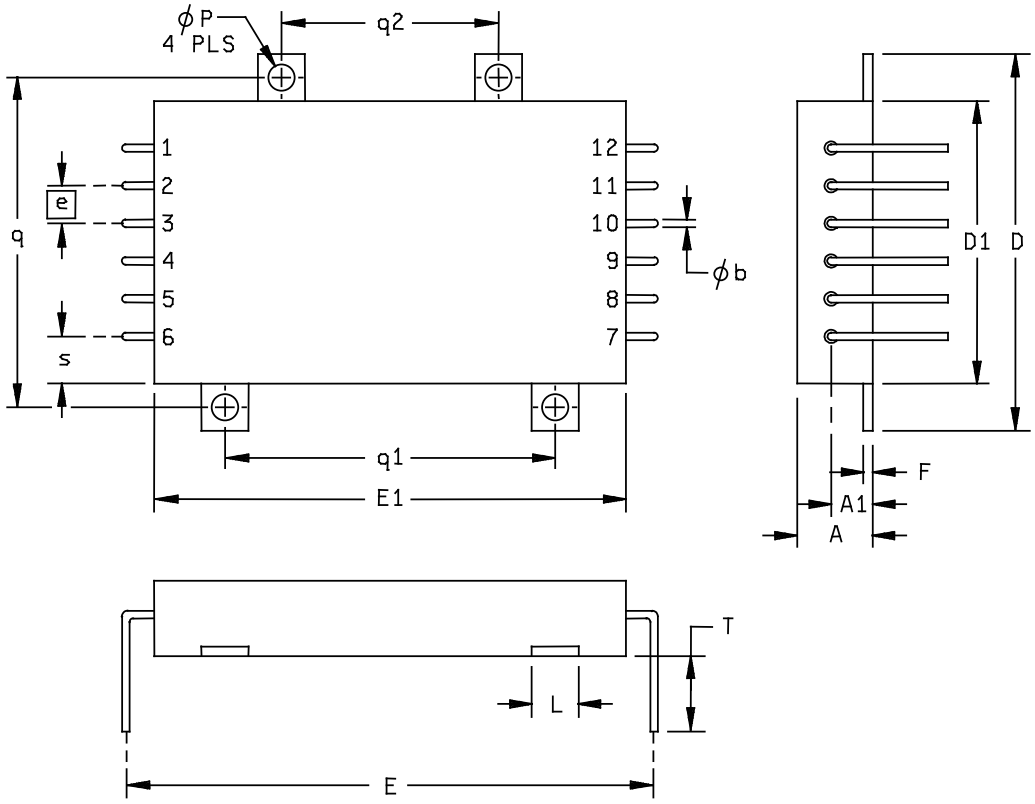


Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		10.16		.400
A1	5.33	5.84	.210	.230
f b	0.89	1.14	.035	.045
D	50.55	51.05	1.990	2.010
D1	37.85	38.35	1.490	1.510
e	5.08 BSC		.200 BSC	
E	63.25	63.75	2.490	2.510
F	1.14	1.40	.045	.055
L	6.99	8.26	.275	.325
L1	6.10	6.60	.240	.260
f P	3.43	3.68	.135	.145
q/q1	44.20	44.70	1.740	1.760
q2	28.96	29.46	1.140	1.160
s	6.10	6.60	.240	.260

NOTES:
1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Device weight: 100 grams maximum.

FIGURE 1. Case outlines - Continued.

Case outline Z.



Symbol	Millimeters		Inches	
	Min	Max	Min	Max
A		10.16		.400
A1	5.33	5.84	.210	.230
f b	0.89	1.14	.035	.045
D	50.55	51.05	1.990	2.010
D1	37.85	38.35	1.490	1.510
e	5.08 BSC		.200 BSC	
E	69.85	72.39	2.750	2.850
E1	63.25	63.75	2.490	2.510
F	1.14	1.40	.045	.055
L	6.10	6.60	.240	.260
f P	3.43	3.68	.135	.145
q/q1	44.20	44.70	1.740	1.760
q2	28.96	29.46	1.140	1.160
s	6.10	6.60	.240	.260
T	8.64	9.65	.340	.380

NOTES:
1. The U.S. government preferred system of measurement is the metric SI. This item was designed using inch-pound units of measurement. In case of problems involving conflicts between the metric and inch-pound units, the inch-pound units shall rule.
2. Device weight: 100 grams maximum.

FIGURE 1. Case outlines - Continued.

Device type	01	02
Case outlines	X	T, U, X, Y, and Z
Terminal number	Terminal symbol	Terminal symbol
1	Input	Input
2	Input common	Input common
3	Tri	Tri
4	Inhibit 1	Inhibit 1
5	Sync output	Sync output
6	Sync input	Sync input
7	Positive output	Positive output
8	Output common	Output common
9	Remote sense return	Remote sense return
10	Positive remote sense	Positive remote sense
11	Slave to master	Slave to master
12	Master to slave/ Inhibit 2	Master to slave/ Inhibit 2

NOTES:

1. Multiple devices may be used in parallel to drive a common load. When using this mode of operation the load current is shared by two or three devices. In the current sharing mode, one device is designated as the master. The slave to master pin (pin 11) of the master device is not connected and the master to slave/inhibit 2 pin (pin 12) of the master is connected to the slave to master pin (pin 11) of the slave device(s). The device(s) designated as slave(s) have the master to slave/inhibit 2 pin (pin 12) connected to the remote sense return pin (pin 9).

2. A second slave device may be placed in parallel with a master and slave device, this requires the Tri pin (pin 3) of the master device to be connected to the remote sense return pin (pin 9). When paralleled, 95 percent of the sum of the power of the devices is available at the load. This means that 143 watts at 5 volts is available for three devices in parallel. When using remote sense in parallel operation, only the master device should have its remote sense pins (pins 9 and 10) connected to the load, and the slave devices should have the remote sense pins (pins 9 and 10) connected to the output pins (pins 7 and 8).

3. The device has a sync input pin (pin 6) and a sync output pin (pin 5) which allows multiple devices, whether they're in a single unit or master/slave configurations to be synchronized to a system clock or each other. Two or more devices may be synchronized to each other by connecting the sync output pin (pin 5) of one to the sync input pin (pin 6) of another.

4. The device has two inhibit options, one is ground referenced to the input common and the other is referenced to the output common. The output referred inhibit pin uses the master to slave/inhibit 2 pin (pin 12). This pin is normally used to parallel devices, and a TTL compatible open collector low will inhibit the device when applied to this pin.

FIGURE 2. Terminal connections.

TABLE II. Electrical test requirements.

MIL-PRF-38534 test requirements	Subgroups (in accordance with MIL-PRF-38534, group A test table)
Interim electrical parameters	- - -
Final electrical parameters	1*, 2, 3, 4, 5, 6
Group A test requirements	1, 2, 3, 4, 5, 6
Group C end-point electrical parameters 1/	1, 2, 3
End-point electrical parameters for radiation hardness assurance (RHA) devices	1, 2, 3, 4, 5, 6

* PDA applies to subgroup 1.
1/ As a minimum, for all Group C testing performed after March 10, 2010 manufacturers shall perform subgroups 1, 2, and 3 from the Group A electrical test table (Table C-Xa of MIL-PRF-38534).

4.2 Screening. Screening shall be in accordance with MIL-PRF-38534. The following additional criteria shall apply:

a. Burn-in test, method 1015 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DLA Land and Maritime -VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1015 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1015 of MIL-STD-883.

b. Interim and final electrical test parameters shall be as specified in table II herein, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

4.3 Conformance and periodic inspections. Conformance inspection (CI) and periodic inspection (PI) shall be in accordance with MIL-PRF-38534 and as specified herein.

4.3.1 Group A inspection (CI). Group A inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. Tests shall be as specified in table II herein.

b. Subgroups 7, 8, 9, 10, and 11 shall be omitted.

4.3.2 Group B inspection (PI). Group B inspection shall be in accordance with MIL-PRF-38534.

4.3.3 Group C inspection (PI). Group C inspection shall be in accordance with MIL-PRF-38534 and as follows:

a. End-point electrical parameters shall be as specified in table II herein.

b. Steady-state life test, method 1005 of MIL-STD-883.

(1) Test condition A, B, C, or D. The test circuit shall be maintained by the manufacturer under document revision level control and shall be made available to either DLA Land and Maritime -VA or the acquiring activity upon request. Also, the test circuit shall specify the inputs, outputs, biases, and power dissipation, as applicable, in accordance with the intent specified in method 1005 of MIL-STD-883.

(2) T_A as specified in accordance with table I of method 1005 of MIL-STD-883.

(3) Test duration: 1,000 hours, except as permitted by method 1005 of MIL-STD-883.

4.3.4 Group D inspection (PI). Group D inspection shall be in accordance with MIL-PRF-38534.

4.3.5. Radiation hardness assurance (RHA) . RHA qualification is required only for those devices with the RHA designator as specified herein.

	RHA level P	RHA level L	RHA level R	Units
Total ionizing dose tolerance level	30	50	100	krad (Si)
Single event upset survival level (LET)	40	40	40	MeV-cm^2/mg

a. Radiation dose rate is in accordance with condition C of method 1019 of MIL-STD-883. Unless otherwise specified, components are tested at a rate of 9 rad(Si)/s, in accordance with method 1019 of MIL-STD-750 or MIL-STD-883, as applicable. These parts may be dose rate sensitive in a space environment and may demonstrate enhanced low dose rate effects.

b. The manufacturer shall perform a worst-case and radiation susceptibility analysis on the device. This analysis shall show that the minimum performance requirements of each component has adequate design margin under worst-case operating conditions (extremes of line voltage, temperatures, load, frequency, radiation environment, etc.). This analysis guarantees the post-irradiation parameter limits specified in table I.

c. RHA testing shall be performed at the component level for initial device qualification, and after design changes that may affect the RHA performance of the device. As an alternative to testing, components may be procured to manufacturer radiation guarantees that meet the minimum performance requirements. Component radiation performance guarantees shall be established in compliance with MIL-PRF-19500, Group D or MIL-PRF-38535, Group E, as applicable. For components with less than adequate performance margin, component lot radiation acceptance screening shall be performed.

d. The manufacturer shall establish procedures controlling component radiation testing, and shall establish radiation test plans used to implement component lot qualification during procurement. Test plans and test reports shall be filed and controlled in accordance with the manufacturer's configuration management system.

e. The device manufacturer shall designate a RHA program manager to oversee component lot qualification, and to monitor design changes for continued compliance to RHA requirements.

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-PRF-38534.

6. NOTES

6.1 Intended use. Microcircuits conforming to this drawing are intended for use for Government microcircuit applications (original equipment), design applications, and logistics purposes.

6.2 Replaceability. Microcircuits covered by this drawing will replace the same generic device covered by a contractor-prepared specification or drawing.

6.3 Configuration control of SMD's. All proposed changes to existing SMD's will be coordinated as specified in MIL-PRF-38534.

6.4 Record of users. Military and industrial users shall inform DLA Land and Maritime when a system application requires configuration control and the applicable SMD to that system. DLA Land and Maritime will maintain a record of users and this list will be used for coordination and distribution of changes to the drawings. Users of drawings covering microelectronic devices (FSC 5962) should contact DLA Land and Maritime-VA, telephone (614) 692-0547.

6.5 Comments. Comments on this drawing should be directed to DLA Land and Maritime-VA, Columbus, Ohio 43218-3990, or telephone (614) 692-1081.

6.6 Sources of supply. Sources of supply are listed in MIL-HDBK-103 and QML-38534. The vendors listed in MIL-HDBK-103 and QML-38534 have submitted a certificate of compliance (see 3.7 herein) to DLA Land and Maritime-VA and have agreed to this drawing.

STANDARD MICROCIRCUIT DRAWING BULLETIN

DATE: 12-06-01

Approved sources of supply for SMD 5962-06213 are listed below for immediate acquisition information only and shall be added to MIL-HDBK-103 and QML-38534 during the next revisions. MIL-HDBK-103 and QML-38534 will be revised to include the addition or deletion of sources. The vendors listed below have agreed to this drawing and a certificate of compliance has been submitted to and accepted by DLA Land and Maritime -VA. This information bulletin is superseded by the next dated revisions of MIL-HDBK-103 and QML-38534. DLA Land and Maritime maintains an online database of all current sources of supply at http://www.landandmaritime.dla.mil/Programs/Smcr/.

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-0621302HTA	50821	SMFL283R3SW/HO
5962-0621302HTC	50821	SMFL283R3SW/HO
5962P0621302HTA	50821	SMFL283R3SW/HP
5962P0621302HTC	50821	SMFL283R3SW/HP
5962L0621302HTA	50821	SMFL283R3SW/HL
5962L0621302HTC	50821	SMFL283R3SW/HL
5962R0621302HTA	50821	SMFL283R3SW/HR
5962R0621302HTC	50821	SMFL283R3SW/HR
5962P0621302KTA	50821	SMFL283R3SW/KP
5962P0621302KTC	50821	SMFL283R3SW/KP
5962L0621302KTA	50821	SMFL283R3SW/KL
5962L0621302KTC	50821	SMFL283R3SW/KL
5962R0621302KTA	50821	SMFL283R3SW/KR
5962R0621302KTC	50821	SMFL283R3SW/KR
5962-0621302HUA	50821	SMFL283R3SV/HO
5962-0621302HUC	50821	SMFL283R3SV/HO
5962P0621302HUA	50821	SMFL283R3SV/HP
5962P0621302HUC	50821	SMFL283R3SV/HP
5962L0621302HUA	50821	SMFL283R3SV/HL
5962L0621302HUC	50821	SMFL283R3SV/HL
5962R0621302HUA	50821	SMFL283R3SV/HR
5962R0621302HUC	50821	SMFL283R3SV/HR
5962P0621302KUA	50821	SMFL283R3SV/KP
5962P0621302KUC	50821	SMFL283R3SV/KP
5962L0621302KUA	50821	SMFL283R3SV/KL
5962L0621302KUC	50821	SMFL283R3SV/KL
5962R0621302KUA	50821	SMFL283R3SV/KR
5962R0621302KUC	50821	SMFL283R3SV/KR
5962-0621301HXA	50821	MFL283R3S/883
5962-0621301HXC	50821	MFL283R3S/883
5962-0621302HXA	50821	SMFL283R3S/HO
5962-0621302HXC	50821	SMFL283R3S/HO
5962P0621302HXA	50821	SMFL283R3S/HP
5962P0621302HXC	50821	SMFL283R3S/HP
5962L0621302HXA	50821	SMFL283R3S/HL
5962L0621302HXC	50821	SMFL283R3S/HL
5962R0621302HXA	50821	SMFL283R3S/HR
5962R0621302HXC	50821	SMFL283R3S/HR
5962P0621302KXA	50821	SMFL283R3S/KP
5962P0621302KXC	50821	SMFL283R3S/KP
5962L0621302KXA	50821	SMFL283R3S/KL
5962L0621302KXC	50821	SMFL283R3S/KL
5962R0621302KXA	50821	SMFL283R3S/KR
5962R0621302KXC	50821	SMFL283R3S/KR

Standard microcircuit drawing PIN 1/	Vendor CAGE number	Vendor similar PIN 2/
5962-0621302HYA	50821	SMFL283R3SY/HO
5962-0621302HYC	50821	SMFL283R3SY/HO
5962P0621302HYA	50821	SMFL283R3SY/HP
5962P0621302HYC	50821	SMFL283R3SY/HP
5962L0621302HYA	50821	SMFL283R3SY/HL
5962L0621302HYC	50821	SMFL283R3SY/HL
5962R0621302HYA	50821	SMFL283R3SY/HR
5962R0621302HYC	50821	SMFL283R3SY/HR
5962P0621302KYA	50821	SMFL283R3SY/KP
5962P0621302KYC	50821	SMFL283R3SY/KP
5962L0621302KYA	50821	SMFL283R3SY/KL
5962L0621302KYC	50821	SMFL283R3SY/KL
5962R0621302KYA	50821	SMFL283R3SY/KR
5962R0621302KYC	50821	SMFL283R3SY/KR
5962-0621302HZA	50821	SMFL283R3SZ/HO
5962-0621302HZC	50821	SMFL283R3SZ/HO
5962P0621302HZA	50821	SMFL283R3SZ/HP
5962P0621302HZC	50821	SMFL283R3SZ/HP
5962L0621302HZA	50821	SMFL283R3SZ/HL
5962L0621302HZC	50821	SMFL283R3SZ/HL
5962R0621302HZA	50821	SMFL283R3SZ/HR
5962R0621302HZC	50821	SMFL283R3SZ/HR
5962P0621302KZA	50821	SMFL283R3SZ/KP
5962P0621302KZC	50821	SMFL283R3SZ/KP
5962L0621302KZA	50821	SMFL283R3SZ/KL
5962L0621302KZC	50821	SMFL283R3SZ/KL
5962R0621302KZA	50821	SMFL283R3SZ/KR
5962R0621302KZC	50821	SMFL283R3SZ/KR

1/ The lead finish shown for each PIN representing a hermetic package is the most readily available from the manufacturer listed for that part. If the desired lead finish is not listed contact the Vendor to determine its availability.

2/ Caution. Do not use this number for item acquisition. Items acquired to this number may not satisfy the performance requirements of this drawing.

Vendor CAGE number	Vendor name and address
50821	Crane Electronics Incorporated 10301 Willows Road NE Redmond, WA 98052